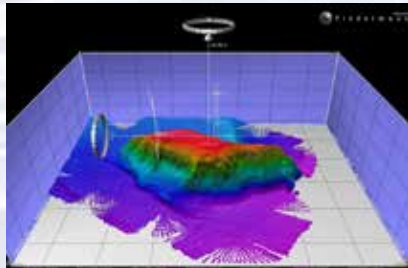




## Ocean Explorer Digital Atlas Supplement



Fledermaus image of Mytilus Seamount.

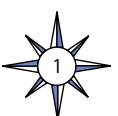
### Northeast U.S. Canyons Expedition 2013: Mytilus Seamount

This activity illustrates how to use the Digital Atlas and how to use the Fledermaus software, and extends the Ocean Explorer Digital Atlas Supplement to explore a different location.

1. Open the Ocean Explorer Digital Atlas at [http://www.ncddc.noaa.gov/website/google\\_maps/OE/mapsOE.htm](http://www.ncddc.noaa.gov/website/google_maps/OE/mapsOE.htm)
2. In the left column click on the **Search by Text** tab at the bottom. In the text box type *Okeanos Explorer*. The dots that will appear on the map are all of the *Okeanos Explorer* expeditions color-coded by year.



3. In the column on the right, scroll to find the 2013 *Okeanos Explorer* Northeast U.S. Canyons Expedition (EX1304L2). At the time of this writing, this is #15 in the list. Tell students that cruises are named with an abbreviation of the ship name ("EX" is used as an abbreviation for Okeanos Explorer), the last two digits of the year in which the cruise took place ("13"), the number of the cruise (this was the fourth cruise for 2013), and the segment or leg (this was the second leg of cruise 04). Click on this cruise and you will see a pop up box as illustrated in the figure below.





Notice the tabs provided at the top of the pop up window. For educator information related to this cruise, click on the [Education](#) tab. This will take you to several educational resources available on the Ocean Explorer website related to this expedition including an Expedition Education Module which provides background information, an introductory video, lessons and more resources associated with the expedition.

*The Northeast U.S. Canyons Expedition* took place during the summer of 2013. During this expedition, a team of scientists and technicians both at-sea and on shore conducted exploratory investigations on the diversity and distribution of deep-sea habitats and marine life along the Northeast U.S. Canyons and at Mytilus Seamount, located within the U.S. Exclusive Economic Zone. The 36-day expedition complemented work done through the *2012 Atlantic Canyons Undersea Mapping Expeditions (ACUMEN)*.

The expedition also marked the first time NOAA's new 6,000 meter remotely operated vehicle (ROV), *Deep Discoverer* and the *Seirios* camera sled and lighting platform were used in a full telepresence-enabled ocean exploration with NOAA Ship *Okeanos Explorer*. When these systems were deployed from the ship, the expedition team was able to provide scientists and audiences onshore with real-time video footage from deepwater areas in important, largely unknown, U.S. waters.

- Click on the [GIS Tools](#) tab in the pop up window, select the first four boxes, and click [Plot on Map](#).



Give the map a moment to load and what appears should look like the figure below.



This shows the ship's entire cruise track and the bathymetric mapping work done throughout the expedition.

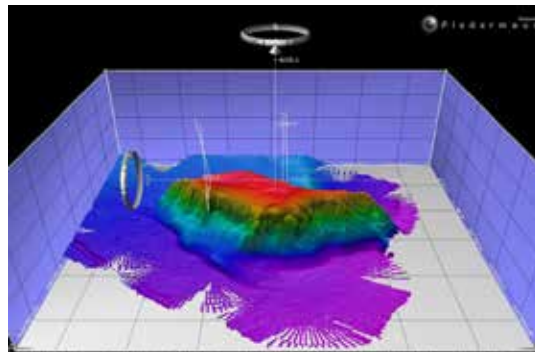
- Click on the map and holding the left cursor down, move the view slightly to the right. A number of named seamounts should come in to view. Notice that Mytilus Seamount was mapped during this mission.



You will also see that two dives took place on the seamount, EX1304L2 Dive 4 and Dive 5.

- Click on [service.ncddc.noaa.gov/rdn/or-waf/media/ex1304l2/EX1304L2\\_MytilusSeamount.scene](http://service.ncddc.noaa.gov/rdn/or-waf/media/ex1304l2/EX1304L2_MytilusSeamount.scene). This will open an interactive scene file of Mytilus Seamount within a three dimensional data visualization system called Fledermaus (This free software must be downloaded to view and manipulate the image in the figure below. See iView4D software from <http://www.qps.nl/display/main/download>)

This is an image of the Mytilus Seamount created from the multibeam sonar data collected as the ship traveled over and mapped the seafloor in this region.





8. Orientation to Fledermaus manipulation tools:

- a) Notice on the top left box that the exaggeration is set at 3.00x. Actual exaggeration is 1. The image has been exaggerated to three in order to view the structure in more detail.
- b) In the column on the left, viewers can select different views of the seamount. Checking the first box will provide a false color map of the seamount with purple being the deepest points and red being the shallowest points. Checking the second box will show the slope. Checking the final two boxes will produce vertical white lines indicated the tracks of the ROV deployed to explore the seamount.
- c) The white x and y axis orients the viewer to distance in meters.
- d) The rings on the left and at the top of the image can be used to manipulate the view. (Note: Use Camera and Reset Camera in the menu bar to return to the original view.)
- e) The ocean floor is shown as a three-dimensional image. The x-axis represents longitude, the y-axis represents latitude, and the z-axis represents depth. When you move the cursor over the image, the window near the bottom of the screen shows the geo coordinates (x, y, and z) for the location beneath the cursor.

Have students analyze the image and develop questions based on their own curiosity. Questions for students to consider might include:

- What is the length of the seamount from east to west?
- What is the length of the seamount from north to south?
- What is the deepest point of this seamount? What is the shallowest point?
- What appears to be one of the steepest point on this seamount?

Based on what they observe in the image and where they know the seamount is located:

- What might be the reason this seamount has a flat top? (Note: one theory is that this seamount was once above sea level and was worn flat by wind and weather.)
- What is the geology like at this seamount? Type of rock? Hardness of rock or sediment?
- What organisms might live here? Why?
- Do you think different organisms live at different depths on this seamount? Why or why not?
- Why did the scientists select these dive locations? If you were the scientist leading this expedition and exploring this seamount for the first time, where would you choose to send the ROV? What considerations do you think need to be made when deciding what regions to select for further exploration?
- What differences might you expect between Dive 4 on the north side of the seamount and Dive 5 on the south side of the seamount?



9. Now go back in the atlas and click on the expedition box on the right, EX1304L2, again. In the pop up window **Summary** tab will be a link to the expedition on the Ocean Explorer website. Click on **Expedition Website**.



This is the main Northeast U.S. Canyons Expedition 2013 webpage. Find and click on the Daily Updates link.



Scroll to Dives 4 (north side of the seamount) and 5 (south side of the seamount) to have students read about what was found during each of these dives.

**Dive 04**  
NOAA Ship Okeanos Explorer  
August 4, 2013

Dive 04 took us to Mytilus Seamount, one of the least explored seamounts of the New England Seamount Chain. The dive started late after an issue with the traction which that required maintenance. While the remotely operated vehicle (ROV) descended to the seafloor, there were very few planktonic organisms observed. The ROV reached the bottom at a depth of 3,271 meters. The dive track ascended a steep portion along the north side of the seamount, from ~3,270 to 2,750 meters. The geology was characterized by a combination of gentle and steeply sloping basalt pillars that were smooth in texture, interspersed with ridges or steps covered with sediment drapes. Periodically, piles of small, dark rocks were observed. All the rocks had a manganese coating. At the start of the dive, various sponges, mostly glass sponges of different forms, populated the rock walls. These included long stalked forms with a "tulp" shaped head, vase, "balloon" hat, globular, and "rosette" shaped. Various species of brittle stars, stalked and non-stalked crinoids, and sea cucumbers were abundant along the rock walls and on the sediment ridges throughout the dive. At around 3,250 meters, the first corals were observed. As the ROV continued up slope, additional corals, including a few different species of bamboo corals as well as *Chrysogorgia*, *Panagorgia*, *Ranunculus*, *Anthemias*, *Corallium*, *Conus*, and two black coral species were noted. No scleractinian corals were documented on the dive. Other fauna observed included hermit crabs, squat lobsters, the coral-eating sea slug, several bryozoans, two featherduster polychaete worms, and barnacles. At 2,800 meters, a large bamboo coral colony with associated crinoids was imaged. Several large barnacles were documented throughout the remainder of the dive. At the end of the dive, a pillow lava was observed. Very few fish, including a triggerfish, sole eye, and mesopodichthys eel, were documented. Our dive at Mytilus Seamount represents the most comprehensive

**Dive 05**  
NOAA Ship Okeanos Explorer  
August 5, 2013

Our fifth dive took place on the south side of Mytilus Seamount and contrasted with the north wall dive in many ways. The remotely operated vehicle (ROV) was on bottom at 3,252 meters. The terrain was gently sloping sandy sediment with scattered cobbles, including darker-colored manganese-coated basalt and lighter-colored manganese-coated basalt. More fish were noted during this dive than were on the north side of the seamount. They were present mostly on the sediment areas at the beginning and end of the dive. High abundances and diversity of sponges were noted throughout the dive once we ascended to hard substrates, including several types observed on Mytilus dive #4. "Tulp" shaped, vase sponges, and some new forms, primarily hexactinellids. A few crustaceans were observed, including hermit crabs with anemone houses, shrimp, and squat lobsters (*Munidopsis* sp.). The first coral noted on the dive was a sea pen observed on the sediment surface. The general substrate throughout the dive was composed of large basalt ledges with thin to thick sediment drapes, steep rocks, and some smooth basalt pillars transitioning to mostly sediment with cobble at approximately 2,637 meters. Up to 13 octocorals were observed during the dive, including our first observation of *Calyptobryopsis*. Three types of black corals were also noted. We noted discrete zonation present on a bamboo coral, with brittle stars, barnacles, and bryozoans covering different sections of the mostly dead coral. A few sea stars were observed during yesterday's dive were also noted today, including *Diopatra* (coral eating type), *Amphiprion*, and *Platypharodon*. At the end of the dive, we noted a piece of wood that was heavily bored, with several lobsters perched on one end. The ROV was off bottom at 2326 UTC, leaving from a depth of 3,293 meters.

Ask students:

Why did scientists select this seamount for exploration (This is one of the least explored seamounts of the NE Seamount Chain.)

What was the deepest point the ROV traveled during these two dives? (3271 meters)

What is the primary type of rock present at this seamount? (basalt) Why? (The New England Seamount chain is a line of extinct volcanoes running from the southern side of Georges Bank midway across the western Atlantic.)



Why do you think there were more fish found on the south side of the seamount vs the north side? (possible food sources; possible hiding places)

10. Now that students have read the two Dive logs, discuss possible answers to some of their questions from #8.

11. Ask students if they were to take what was learned from this exploration and go back to investigate further, what would be their area of interest? What would they want to know?

Possible areas of further exploration:

Why did the basalt rocks in Dive 4 have a manganese coating?

How did pillow lava form in this location?

Why do the hermit crabs found here have anemone houses?

Why did different organisms inhabit different locations on the bamboo coral?

What are some possible food chains and food webs in this region?

Do different corals live at different depths?

Why are there different organisms on the north vs the south side of this seamount?

12. Once students have shared their interests for further exploration, have them read the following Mission Log from August 6, 2013 following the two dives locations just explored.

<http://oceanexplorer.noaa.gov/okeanos/explorations/ex1304/logs/aug6/aug6.html>

## Additional Resources

*[Ocean Explorer Seamounts Theme page](#)*

This page compiles some of the best ocean explorer education resources on seamounts including essays, lessons, multimedia activities and links to past expeditions.

*[Seamounts, Les Watling Ph.D., University of Hawai'i at Manoa](#)*

In this 45 minute video, Dr. Les Watling, marine scientist at the University of Hawai'i at Manoa, provides an excellent description of the formation of seamounts, their geology and their associated ecological and biological diversity.

## Send Us Your Feedback

In addition to consultation with expedition scientists, the development of lesson plans and other education products is guided by comments and suggestions from educators and others who use these materials. Please send questions and comments about these materials to: [oceanexeducation@noaa.gov](mailto:oceanexeducation@noaa.gov)

## For More Information

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